The Role of Multinational Enterprises in the Transition Process of Central and Eastern European Economies

Marek, Philipp

5 Spillovers from Services FDI to Manufacturing Firms in New EU Member States

5.1 Introduction

The empirical investigation of spillovers from foreign affiliates to local firms is one of the main FDI related research and policy issues. FDI spillovers can occur between firms that are in direct competition (horizontal, intra-industry spillovers) or vertically integrated with foreign affiliates (vertical, inter-industry spillovers). Additionally, vertical linkages can be classified into forward (domestic firms demanding inputs of foreign affiliates) and backward (domestic firms supplying foreign affiliates). The main conclusion of the empirical studies is that vertical backward spillovers are more likely to take place than horizontal and forward spillovers (see e.g. Havranek and Irsova 2011).

So far the literature on FDI spillovers has focused on the impact of FDI in manufacturing. Concerning services FDI, empirical evidence on the existence of spillovers is limited, although the share of services FDI has grown in recent years. This is particularly true for the new EU member states (NMS). At the end of the year 2009, services accounted for 67.5% of total inward FDI stock in the Central East European NMS; business services amounting to the highest share of 19.4%, followed by finance with 18.8%, trade 13.1%, transport, storage and communications 6.8%, electricity, gas and water supply 5.8%, construction 2.5%, and all other services with a share of 1.1% (Hunya 2011). This raises the question about spillover effects from services FDI in general and, in particular, to manufacturing in Central and Eastern Europe (Hoekman 2006; Francois and Hoekman 2010).

There are two basic reasons for assuming that positive spillover effects exist from services FDI to manufacturing. Firstly, foreign affiliates typically introduce superior technologies and organizational skills to the local economy, which may affect domestic firms, if foreign investors cannot fully internalize their technological advantages (Griliches, 1979, 1992). Secondly, services inputs play an important role in the production of goods and other services, which has been recognized in theoretical models (Francois 1990; Hoekman and Mattoo 2008; Francois and Hoekman 2010) and empirically been proofed (Inklaar, Timmer, and Van Ark 2007; Inklaar, Timmer, and Van Ark 2008; Francois and Woerz 2008; Rubalcaba-Bermejo 1999; Peneder, Kaniovski, and Dachs 2000; Eschenbach and Hoekman 2006; Arnold, Mattoo, and

Narciso 2008) in the economic literature. Underdeveloped services sectors were a distinctive socialist legacy in CEE transition economies (Bolton, Roland, et al. 1992). The transition process has brought a far reaching liberalization of services in the NMS (see e.g. Gabrisch and Hölscher 2006:p.60ff). This has been crucial as the liberalization of services via trade and FDI is recognized as one of the main channels for improving services performance, which can be considered as one of the obstacles to the fast growth and development in the transition process.

The fundamental function of most services in relation to overall economic growth is that they are inputs into production (Hoekman and Mattoo 2008) and, as such, a key determinant of the competitiveness of all firms in open economies, no matter what they produce (Hoekman 2006). As a consequence, the literature on services liberalization mainly deals with its impact on other sectors, most notably manufacturing. Liberalization of services involves the entrance of new providers leading to lower prices, higher quality and, if they are innovative, greater variety of services (Arnold, Javorcik, and Mattoo 2011; Fernandes and Paunov 2012). The entry of foreign providers may play a particularly important role in realizing these benefits. Since many services require on-the-spot presence for their delivery, FDI can be considered as a key channel for realizing these benefits (Hoekman and Mattoo 2008). Empirical studies report a positive impact of services liberalization on exports (Boatman 1992; Francois, Manchin, and Pelkmans-Balaoing 2009; Francois and Woerz 2008) and productivity (Robinson, Wang, and Martin 2002; Nicoletti and Scarpetta 2003; Conway, De Rosa, et al. 2006; Rajan and Zingales 1998; Fernald 1999; Forlani 2010; Fernandes 2009; Cummins and Rubio-Misas 2006) of the manufacturing industry.

The objective of the chapter is to provide a multi-country study on the spillover effects from services FDI to manufacturing in the NMS. For this purpose the analysis is based on firm-level data, which allows accounting for firm heterogeneity with respect to size, ownership and balance sheet information. The analysis takes heterogeneity into account in order to investigate whether the expected forward spillovers depend on the position of the supplying services sector and of the demanding manufacturing sector in the production chain. In line with Fernandes and Paunov (2012), the analysis investigates whether firms, which are relatively dependent on particular services, should (ceteris paribus) benefit disproportionately more from increases in services FDI than firms with a lower share of services inputs.

The analysis is based on a firm-level database that consists of a panel of around $40,000$ firms in six Central East European (Bulgaria, Czech Republic, Estonia,

Romania, Slovakia and Slovenia) for the period between 2003 and 2008. Empirically, the firms' productivity is expressed as the value added per employee and serves as the dependent variable in an OLS regression framework with firm-fixed effects. Since the share of services inputs of foreign-owned firms is typically not observable in firm-level databases, the analysis is based on input-output tables, reflecting the demand and supply across all sectors of the economy, in order to capture the key explanatory variables of interest, namely the extent of vertical linkages.

The results of this analysis report a positive impact of services FDI on the productivity growth of domestic manufacturing firms, whereas the effect of services FDI on foreign controlled firms in the host economy is insignificant. The findings suggest that the increasing share of services provided by foreign-controlled firms enhanced the productivity growth of domestic manufacturing firms by 0.16% over the period of analysis. By considering several dimensions of firm heterogeneity in the regression, the results show that small firms as well as large domestic firms with an initially low productivity are the beneficiaries of forward spillovers induced by services FDI. Accounting for differences across manufacturing sectors, the results show that services FDI spillovers are larger for science-based firms and for manufacturing firms belonging to sectors at the end of the value chain with a high degree of inputs. A sectoral disaggregation into five services sectors identifies the energy sector to be the most important driver of positive spillover effect of services FDI in the manufacturing industry. By splitting the manufacturing sector into four groups according to Pavitt's classification (Pavitt 1984), the results show that each group is exposed to a different spillover pattern induced by services FDI. In comparison to previous studies on services FDI spillovers, which investigate the aggregate effect of services FDI for a single economy, this chapter contributes to the literature through a multi-country framework of transition economies, the consideration of annual input-output tables and the sectoral disaggregation of FDI spillovers from services to manufacturing on the demand and supply side.

This chapter is organized as follows: Section 5.2 provides a literature review on services FDI spillovers on the manufacturing industry. Section 5.3 describes the the construction of the sample followed by the econometric approach in Section 5.4. The findings are presented in section 5.5, and section 5.6 presents the conclusion.

5.2 Literature Review

FDI spillovers from foreign affiliates to domestic firms take place when the advantages of the entry or presence of foreign affiliates, which typically have better technologies and organizational skills than domestic firms, cannot be completely internalized by the foreign firm itself. Under this condition FDI leads to external effects in the host economy (Griliches, 1979, 1992). FDI spillovers can occur between firms that are vertically integrated with foreign affiliates (vertical, inter-industry spillovers) or in direct competition with them (intra-industry spillovers). The substantial body of the empirical literature on FDI spillovers has produced mixed empirical results on the subject. Nowadays, the dominant approach to spillovers analysis is based on firm-level information and preferably panel data analysis (Görg and Strobl 2001; Görg and Greenaway 2004; Keller and Yeaple 2009; Keller 2004; Knell and Rojec 2007; Jindra 2011). Most firm level studies cast doubt on the existence of FDI spillovers in developing countries (see e.g. Haddad and Harrison 1993; Aitken and Harrison 1999; Harrison 1996; Blomström and Sjöholm 1999; Lim 2001); if positive, they have been found to be limited to certain (types of) industries (Haddad and Harrison 1993; Blomström and Sjöholm 1999; Blomström, Kokko, and Zejan 1994). For industrialized countries the picture is slightly more optimistic (see e.g. Girma, Greenaway, and Wakelin 2001; Haskel, Pereira, and Slaughter 2007; Barry, Görg, and Strobl 2002; Alverez, Damijan, and Knell 2002).

Since recently, firm-level panel data analysis of FDI spillovers has been providing more encouraging results, which predominantly base on a differentiation between vertical and horizontal FDI spillovers. The majority of previous studies focuses on FDI spillovers in manufacturing. In their meta-analysis of 3,626 spillover estimates taken from 57 studies[50], Havranek and Irsova (2011) conclude that the spillover effects of vertical backward linkages are positive on average and that spillover effects are more pronounced in open economies with underdeveloped financial systems.

For transition countries, Damijan, Knell, et al. (2003), Gorodnichenko, Svejnar, and Terrell (2007), Schoors and Van Der Tol (2002), and Javorcik (2004) find some evidence of (backward) vertical spillovers from FDI, whereas firm-level panel data suggest only few intra-industry FDI spillovers (Konings 2001; Djankov and Hoekman 1998; Kinoshita 2000; Tytell and Yudaeva 2006). As summarized by Havranek and

[50] The meta analysis includes only studies on FDI spillovers, which reported empirical estimates of the effect of vertical linkages.

Irsova (2011), it seems that horizontal intra-industry spillovers and vertical forward spillovers are less likely to take place than vertical backward spillovers. Furthermore, the literature has shown that the consideration of the heterogeneity of domestic firms in the models is crucial, since not all firms are capable of absorbing spillovers from foreign affiliates. Without a certain level of absorptive capacity, domestic firms may not be able to benefit from the presence of foreign affiliates; i.e. the heterogeneity of domestic firms as far as productivity, technological capacity, and human capital co-determines their ability to absorb knowledge spillovers from foreign affiliates. Merlevede, Schoors, and Spatareanu (2014) find that in Romania the effect of FDI on local firms depends on the time dimension and on the spatial proximity to the foreign-owned firms. Over time, foreign subsidiaries may tend to intensify their vertical relations with local firms and to establish more stable linkages with the local environment.[51] In their paper on backward spillovers from foreign owned firms in Ireland, Barrios, Görg, and Strobl (2011) observe that the impact of these spillovers is sensitive to its measurement, stressing three restrictive proportionality assumptions, which are subject to a vast set of spillover papers. Additionally, Javorcik and Spatareanu (2011) conclude that the impact of spillovers from foreign affiliates is affected by the origin of the investor.

Specific research on spillovers from services FDI is relatively new. Services FDI could increase the productivity of manufacturing firms through lower prices of services, higher quality of services, greater variety of services, but also via an increased competition and (horizontal) knowledge spillovers to local services firms (Arnold, Javorcik, and Mattoo 2011; Fernandes and Paunov 2012). Additionally, UNCTAD (2004) provides a comprehensive list of possible spillover effects of services FDI coming from 'stimulating improvements in competing services firms as well as for customers and suppliers'. More precisely, spillovers from services FDI arise from: (i) better services provision in terms of supply, cost, quality and variety of services; (ii) transfer of technology via skills transfer, and the knowledge content of services, (iii) outsourcing of some of the work related to the production of services to local companies. However, services FDI also contain some risks of relevance for the assessment of spillovers potential as foreign affiliates providing services may crowd out competing domestic firms. This depends on the initial conditions in the host country; more precisely on the level of economic development, on the market structure of services sectors and on the regulatory framework in the relevant country. Concerning

[51] For an overview of the relevant literature see Knell and Rojec (2007)

services FDI, empirical research has proven positive spillovers to the services sectors themselves and even more so to manufacturing firms. As claimed by Hoekman and Mattoo (2008), the positive association between productivity growth performance of downstream firms and services FDI is perhaps the most robust finding to emerge from the limited empirical research on services FDI spillovers.

For this chapter, the most important references are Fernandes and Paunov (2012) and Arnold, Javorcik, and Mattoo (2011) since they deal with a similar subject and methodology. Fernandes and Paunov (2012) examine the effects of FDI in services on the productivity growth of Chilean manufacturing firms between 1992 and 2004 by using sectoral input information at the firm-level. Instead of using information from input-output tables, Fernandes and Paunov (2012) use exact input information at the firm-level allowing a precise identification of strong users of services within the manufacturing industry including changes in the demand of across manufacturing plants. Their results show a positive and significant effect of services FDI on productivity growth of Chilean manufacturing firms with an intensive use of services.

In their analysis of firm-level data for the Czech Republic for the period prior its accession to the EU (1998–2003), Arnold, Javorcik, and Mattoo (2011) find a positive relationship between FDI in services and the performance of domestic manufacturing firms. The manufacturing-services linkage is expressed by the degree to which manufacturing firms rely on intermediate inputs from services industries as reflected in the national input-output tables. The data reveal a productivity increase taking place after the foreign acquisitions of Czech services firms.[52]

Quite a number of studies on services FDI spillovers focuses on specific services sectors or put sectoral aspects in the focus of their interest. This may be important in distinguishing between backward and forward vertical spillovers from FDI. Services sectors can be split into services activities used in the production process of other economic units and services for final consumption such as hotels and construction (see e.g. OECD 2005; Fernandes 2009). According to Dunning and Lundan (2008), the potential for linkages in the services sector differs between industries. For example, foreign affiliates in infrastructure services establish forward linkages with their clients and channel know-how and management expertise (see more in Dunning and Lundan

[52] These results are in line with a study by Shepotylo and Vakhitov (2012), who observe a positive impact of services liberalization on the productivity of manufacturing firms in the Ukraine.

2008). With respect to technology related knowledge intensive services, Sass and Fifekova (2011) and Stare (2001) focus on the effects of FDI in in the sector of business services.

5.3 Data and Descriptive Statistics

This chapter focuses on the impact of FDI in the services sector on the productivity of manufacturing firms in six new member states of the European Union (NMS): Bulgaria, Czech Republic, Estonia, Romania, Slovakia and Slovenia.[53] For this purpose, the analysis combines firm-level information obtained from Bureau van Dijk's Amadeus database with sectoral statistics provided by Eurostat and the World Input Output Database (wiod). The Amadeus Database contains balance sheet information of firms such as operating turnover, value added, tangible fixed assets, and employment as well as information of the firms' ownership structure.

Table 5.1: Average share of foreign services inputs in manufacturing firm between 2003 and 2008

Country	Total	Energy Supply Nace 40-41	Wholes. & Retail Nace 50-52	Infrastruc. Nace 60-64	Financ. Ser. Nace 65-67	Business Ser. Nace 70-74
Bulgaria	10.4%	2.2%	3.3%	3.2%	0.9%	0.9%
Czech Republic	15.1%	1.6%	8.0%	2.9%	0.9%	1.1%
Estonia	13.0%	1.6%	5.6%	3.5%	0.8%	1.5%
Romania	10.9%	2.4%	2.8%	2.4%	1.1%	2.1%
Slovakia	21.9%	8.5%	7.8%	3.4%	0.8%	1.5%
Slovenia	7.7%	0.2%	5.4%	0.6%	0.1%	1.3%

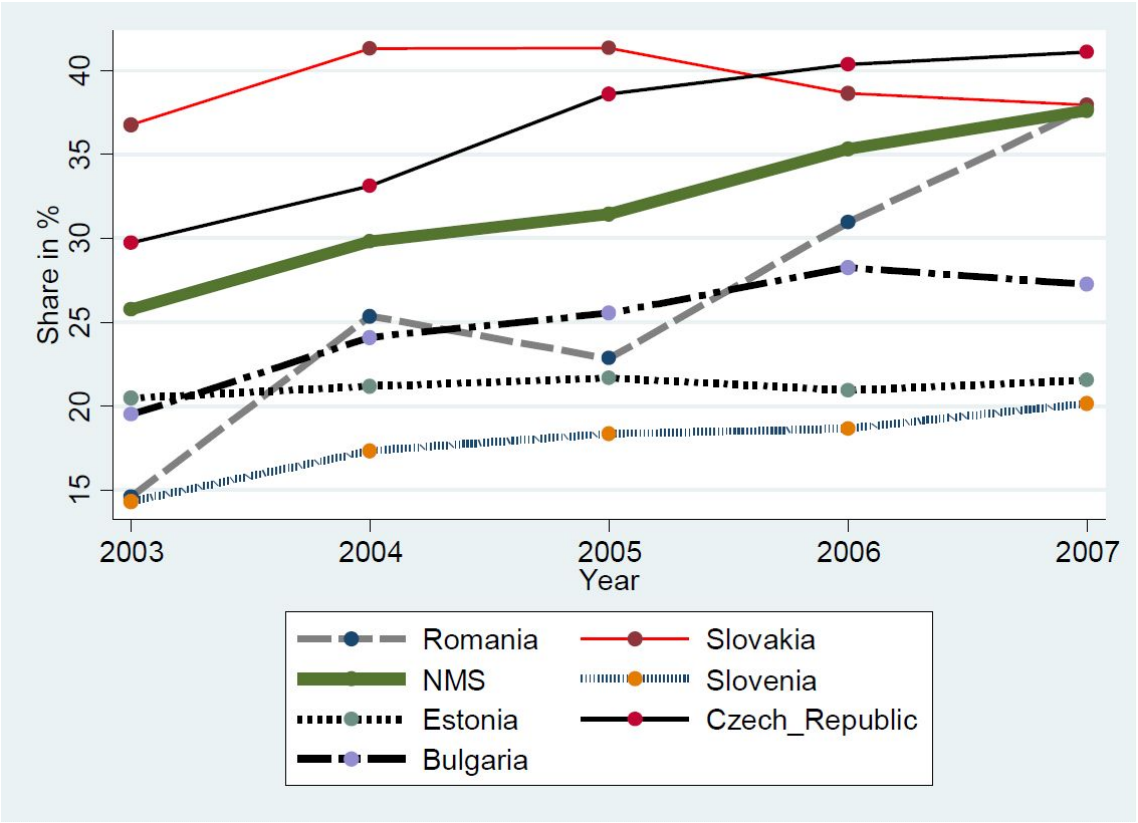
Source: World Input Output Database and Eurostat

The dependent variable of this analysis is taken from balance sheet information, the firm-specific productivity expressed as value added per employee. The dataset is an unbalanced panel and includes 39,425 manufacturing firms registered in one of the six countries, which reported at least once 10 employees within the period between 2003 and 2009. The financial information were reported in the national currency. These nominal values were transformed through the application of GDP deflators with the year 2003 serving as the benchmark. In order to generate a consistent dataset, the constant price values were converted into US Dollars using the purchasing power parity (PPP) exchange rate of the year 2003. The deflator and the PPP exchange

[53] Hungarian, Lithuanian, Latvian and Polish firms were not be included in the sample due to missing information on the firms' capital stock (Lithuania and Latvia), missing sectoral statistics (Poland), or a low quality of firm-level information (Hungary).

rate are obtained from the World Economic Outlook database provided by the International Monetary Fund (IMF).[54]

Figure 5.1: Development of foreign output in services



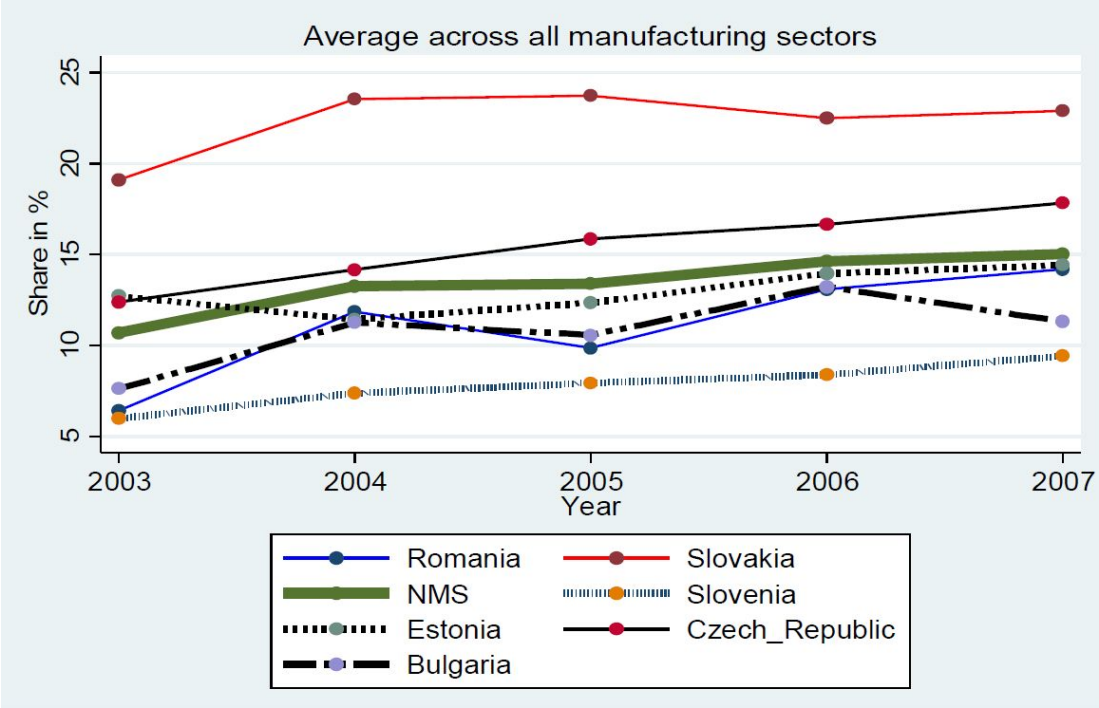
Source: Eurostat

This section provides a short overview on the descriptive statistics of the foreign ownership in the services sectors of consideration and how the share of foreign services evolved during the period of analysis.

Table 5.1 lists the average foreign services linkage across all manufacturing sectors for each country. In the six countries, the share of services provided by foreign controlled firms in total domestic inputs is between 7.7% in Slovenia and 21.9% in Slovakia. Except for Slovakia, the majority of foreign controlled services inputs stems from the sector of wholesales and retail trade. In Slovakia the largest share of services provided by foreign controlled companies originates from the energy sector with a share of 8.4%

[54] This procedure is similar to an apporach suggested in the Frascati Manual on R&D. See OECD (2002) Appendix 9 on page 217ff..

Figure 5.2: Share of foreign controlled services over all domestic inputs in manufacturing industry



Source: World Input Output Database and Eurostat

over all domestic inputs.[55] The low level of foreign services in Slovenia is driven by a very low foreign services linkage in the sectors of energy supply (0.2%), infrastructure (0.6%), and the financial sector (0.1%). Except for Slovenia, the pattern on the average shares of foreign inputs stemming from the sectors of telecommunication and transportation, financial services and business services is quite similar across the remaining five countries.

Figure 5.1 illustrates how the share of foreign-controlled services has developed across the six countries over the period between 2003 and 2008. On average, the share of foreign output in the services sectors increased from 24.7% in 2003 to above 37.8% in 2007. The largest rise of foreign presence could be observed in Romania from 14.6% to nearly 37.8%. The Czech (29.7% to 41.1%) and Bulgarian (19.5% to 27.3%) services sectors were also characterized by an increasing foreign presence over the

[55] The information on the foreign share in the Slovak energy sector is not reported by Eurostat due to confidentiality reasons. The missing values for the Slovak energy sector were calculated on the basis of annual information from the Amadeus database. According to Amadeus around 75% of the output in the Slovak energy sector was generated by foreign-controlled firms. This figure is in line with the information on the ratio between FDI stock and sectoral turnover in the energy sector, reporting the highest value for Slovakia.

period of analysis. In Slovenia foreign services gained a moderate share, while the foreign presence in the Estonian and and Slovakian services sectors remained stable at a level of around 15 or 35%, respectively.

Since figure 5.1 indicates that the presence of foreign firms in the services sectors has become more important over the period of analysis, figure 5.2 illustrates the development of the share of services provided by foreign controlled firms over all domestic inputs in the manufacturing industry. On average this share increased from 10.9% to 15.6% over the period of investigation. For Romania the share of foreign services used in manufacturing more than doubled from 6.4 to 14.2%. The other five countries also experienced an increasing share of foreign services used as inputs in manufacturing. Thus, these figures illustrate the increasing relevance of foreign services in CEE manufacturing industries, and thereby provides a compelling motivation to investigate the impact of services FDI on the performance of firms in the NMS.

5.4 Estimation Approach

Empirically, an OLS regression framework with firm-fixed effects is applied with value added per employee of firm i in country c belonging to manufacturing sector m at time t, $(VA/L)_{i,m,c,t}$, serving as the dependent variable. In order to analyze the impact of FDI in the services sector on the productivity of manufacturing firms, two types of explanatory variables are included in the regressions, sector-specific and firm-specific regressors. The key variables of interest belong to the former group. They are operationalized by the share of services inputs over all domestic inputs in manufacturing sector m, as well as by the share of services inputs provided by foreign owned firms over all domestic inputs in the referring manufacturing sector. The consideration of both variables allows us to distinguish between the influence of general services intensity in sector m and the impact of services provided by foreign controlled firms.[56] Since the Amadeus Database does not contain information on the firms' inputs, both services input variables need to be expressed by appropriate proxies.

[56] If only the foreign services linkage was included, the index would also capture the general services intensity of the manufacturing firm.

The calculation of both linkage measures refers to national input-output tables provided by the World Input-Output Database (wiod)[57]. For the countries of the sample, the wiod database contains interpolated annual input-output tables for 35 NACE Rev. 1.1. 2-digit sectors for the period between 1995 and 2009. The share of services inputs in manufacturing sector m is defined as services linkage, $SL_{m,c,t}$, whose calculation bases on the linkage, $q_{s,m,c,t}$, between the corresponding manufacturing sector m and the following services sectors $s \in S$: energy supply (NACE Rev. 1.1. codes 40-41), wholesale trade and retail sales (NACE codes 50-52), transportation and telecommunication (NACE codes 60-64), financial services (NACE codes 65-67) and business services (NACE codes 70-74). Formally, the services linkage, $SL_{m,c,t}$, is defined as the sum of inputs stemming from the services sectors $s \in S$, $\sum_{s=1}^{S} q_{s,m,c,t}$, in all domestically provided inputs, Q, in manufacturing sector m, $Q_{m,c,t}$.

$$SL_{m,c,t} = \frac{\sum_{s=1}^{S} q_{s,m,c,t}}{Q_{m,c,t}}. \tag{5.1}$$

In line with Arnold, Javorcik, and Mattoo (2011), the foreign services linkage, $FOR\_SL_{m,c,t}$, in manufacturing sector m is the sum of the product of the two following factors over the services sectors $s \in S$: firstly, the share of inputs from the service sectors listed above in all domestic inputs; and secondly, the share of output generated by foreign controlled enterprises, $FOR\_turnover_{s,c,t}$, in the corresponding services sector's total output, $turnover_{s,c,t}$. The data of the latter factor is obtained from Eurostat[58].

$$FOR\_SL_{m,c,t} = \sum_{s=1}^{S} \frac{q_{s,m,c,t}}{Q_{m,c,t}} * \frac{FOR\_turnover_{s,c,t}}{turnover_{s,c,t}} \tag{5.2}$$

Furthermore, additional sector-specific information from manufacturing sector m are included as control variables. The size of manufacturing sector m, expressed as the sector's share in total output in country c, covers the impact of sectoral economies of scale on the productivity growth, $sector\_size_{m,c,t}$. The consideration of horizontal FDI spillovers measured by share of output of foreign controlled firms in manufacturing m, $hor\_FDI_{m,c,t}$, enables us to compare the impact between horizontal and vertical FDI spillovers in the manufacturing industry. In the ongoing

[57] See Timmer, Erumban, et al. (2012).

[58] Due to data availability and consistency of the sectoral classification, the sample is restricted to the period between 2003 and 2008

notation the spillover variables described above (services linkage, foreign services linkage, sectoral economies of scale and horizontal FDI) are denoted by the vector $X_{m,c,t}$.

Next to sector-specific variables, firm-specific information are included in order to account for the heterogeneity of firms. More precisely, the analysis investigates how the firm's productivity is influenced by its size, expressed by means of the number of employees, $L_{i,t}$, and its capital intensity determined by the value of tangible fixed assets per employee, $K_{i,t}/L_{i,t}$. The firm's average wage expressed as labor costs per employee, $wage_{i,t}$, captures an additional dimension of the firm's absorptive capacity. Furthermore, the firm's age, $age_{i,t}$, serves as an additional control variable. These firm-specific regressors are denoted by the vector, $Z_{i,t}$. The firm-specific and sector-specific regressors described above are introduced with the lag of one year. Firm-specific intercepts α_i are used as regressors in order to control for unobserved firm heterogeneity. The baseline model is completed by time dummies, d_t, and sector-time dummies, $d_{m,t}$, allowing to control for differences in the technological change across manufacturing sectors m.

$$\ln(VA/L)_{i,m,c,t} = \alpha_i + \beta X_{m,c,t-1} + \gamma Z_{i,t-1} + d_t + d_{m,t} + \epsilon_{i,m,c,t} \tag{5.3}$$

In order to investigate whether the ownership structure of the firms affects the spillovers of services FDI, the sample allows a distinction between domestic and foreign owned enterprises. This information stems from annually extracted information of the Amadeus database between 2003 and 2009. A firm is considered as foreign owned, if at least one foreign shareholder held a minimum share of 10 per cent of the firm's equity capital during the period of this analysis, which is represented by a dummy variable, FDI_i.

In an additional specification, a disaggregation of the services linkage variables allows the investigation of the services sector providing the largest spillover on productivity growth of manufacturing firms. Under this specification, the services linkage is split into the five services sectors described above: energy supply (NACE 40-41), wholesale trade and retail sales (NACE 50-52), transport and telecommunication (NACE 60-64), financial services (NACE 65-67) and business services (NACE 70-74). Next to the multi-country framework of Central East European economies and the consideration of annual input-output tables, the sectoral disaggregation provides an additional contribution to the literature. Previous studies on the impact of services FDI on

manufacturing firms (such as Arnold, Javorcik, and Mattoo, 2011, or Fernandes and Paunov, 2012) only investigated the impact of an aggregate services sector and for a single economy.

As a robustness check, the foreign services linkage is replaced by an indicator capturing the degree of market liberalization of the services sectors. In this specification, the latter factor in equation (5.2), the sectoral share of turnover of foreign owned enterprises, is replaced by the liberalization indicators of the European Bank for Reconstruction and Development (EBRD) for the corresponding services sectors (see Arnold, Javorcik, and Mattoo 2011). For Central European and Central Asian post-transition economies, the EBRD issues an annual transition report, in which the bank evaluates the policy reforms in the following services sectors: banking, telecommunication, transport infrastructure (roads and railways), and water and waste water distribution. The scores of the transition indicators range from 1 (rigid centrally planned) to 4.33 (standards of industrialized market).[59] Since the EBRD does not provide a measure for the sectors of wholesales, retail trade and business services, the missing values are imputed through a calculation of the mean of the five transition indices listed above (see Arnold, Javorcik, and Mattoo 2011).

5.5 Results

The regression results of equation (5.3) are presented in the following section with the foreign services linkage given by equation (5.2) serving as the central explanatory variable. The output in Table 5.2 shows whether forward spillovers from services FDI differ between domestic and foreign controlled firms in the manufacturing industry. Since it turns out that domestic firms are the beneficiaries of services FDI rather than foreign controlled ones, the remaining investigation focuses exclusively on domestic firms. Table 5.3 reports the output with firm-specific and sector-specific regressors including several robustness checks. In order to check whether the results are driven by the country-decomposition of the sample, Table 5.4 presents the results of six subsamples excluding each country once. In Table 5.5 the sample is split into several subsamples driven by the firms' initial size and/or initial productivity. The output for the subsamples based on the sectoral distinction of the manufacturing industry is reported in Tables 5.6 and 5.7. In Table 5.8 the foreign services linkage measure is

[59] See EBRD (2012) p.167.

split into five dimension in order to identify the services sectors driving the spillover effect of services FDI in the manufacturing industry.

Table 5.2: Regression on spillover of services FDI with aggregate foreign service linkage.

dependent Variable $\ln(VA/L)_{i,m,c,t}$	whole sample	whole sample FDI dummy	domestic firms	foreign firms
$SL_{m,c,t-1}$	-0.523***	-0.599***	-0.556***	-0.394**
	(0.115)	(0.121)	(0.121)	(0.163)
$SL_{m,c,t-1} * FDI_i$		0.284**		
		(0.120)		
$FOR\_SL_{m,c,t-1}$	1.076***	1.215***	1.197***	0.525
	(0.280)	(0.288)	(0.309)	(0.388)
$FOR\_SL_{m,c,t-1} * FDI_i$		-0.629***		
		(0.239)		
$hor\_FDI_{m,c,t-1}$	-0.118*	-0.136**	-0.121*	-0.113
	(0.064)	(0.067)	(0.066)	(0.112)
$hor\_FDI_{m,c,t-1} * FDI_i$		0.093		
		(0.086)		
$sector\_size_{m,c,t-1}$	0.910	1.431	2.273*	-3.796
	(1.493)	(1.330)	(1.342)	(3.664)
$sector\_size_{m,c,t-1} * FDI_i$		-2.266		
		(2.569)		
Observations	116,195	116,195	95,331	20,864
Firms	39,475	39,475	32,646	6,829
R-squared	0.019	0.019	0.021	0.023

OLS estimation with firm-fixed effects, robust variance estimates and clustered error terms for sectors within countries. Annual and sector-time dummies included. Standard errors in parentheses: *** p≤0.01, ** p≤0.05, * p≤0.1.

In Table 5.2 only sector-specific regressors are included. For the whole sample, the key variable of interest, $FOR\_SL_{m,t-1}$, reports a significant positive impact of services FDI on the productivity of manufacturing firms. The estimate suggests that a one-percentage point increase in the foreign services linkage leads to an annual productivity growth of 0.0108%. By considering that the share of foreign services over all domestic inputs has increased by 4.5 percentage points between 2003 and 2008, the estimates indicate that the rise of foreign presence in services has lead *ceteris paribus* to a productivity growth of 0.14% over the period of analysis.

The inclusion of an ownership dummy, FDI_i, capturing whether a firm reported at least once a foreign shareholder in the period of investigation, shows that domestic firms benefit significantly more from foreign presence in the services sectors than foreign-owned ones. Despite the significant negative estimate of the interaction term between the foreign services linkage and the ownership dummy, the aggregate effect of services FDI on the productivity of foreign-owned manufacturing firms is positive. This finding is confirmed by splitting the sample into domestic and foreign controlled firms, respectively. For domestic firms the impact of forward spillovers induced

through services FDI is significantly positive with a coefficient estimate of 1.197, suggesting that the rise of foreign services in total input contributes to productivity growth of 0.16% over the period of analysis. Contrary, the effect for the subsample of foreign controlled firms is insignificant. This finding leads to the conclusion that firms with a foreign shareholder might be able to make use of additional opportunities to channel their inputs and are less dependent from domestic services inputs. Due to this finding, the focus of the further analysis concentrates on domestic firms.

Table 5.3: Spillover of services FDI on domestic firms

dependent Variable $\ln(VA/L)_{i,m,c,t}$	baseline	absorptive capacity	dummies	Liberalization Indicators
$SL_{m,c,t-1}$	-0.556***	-0.389**	-0.408**	-2.837***
	(0.138)	(0.163)	(0.185)	(0.451)
$FOR\_SL_{m,c,t-1}$	1.208***	3.324***	0.831**	
	(0.360)	(0.910)	(0.367)	
$FOR\_SL\_EBRD_{m,c,t-1}$				0.758***
				(0.148)
$ln(L)_{i,t-1}$	-0.066***	-0.066***	-0.061***	-0.067***
	(0.014)	(0.014)	(0.014)	(0.014)
$ln(K/L)_{i,t-1}$	0.016	0.123***	0.020*	0.014
	(0.010)	(0.037)	(0.010)	(0.010)
$ln(wage)_{i,t-1}$	0.016	0.019	0.014	0.016
	(0.028)	(0.025)	(0.028)	(0.029)
$ln(age)_{i,t}$	-0.020	-0.022	-0.026	-0.020
	(0.026)	(0.026)	(0.026)	(0.025)
$FOR\_SL_{m,c,t-1} * ln(wage)_{i,t-1}$		0.055		
		(0.155)		
$FOR\_SL_{m,c,t-1} * ln(K/L)_{i,t-1}$		-1.012***		
		(0.307)		
$hor\_FDI_{m,c,t-1}$	-0.192**	-0.189**	-0.146*	-0.136*
	(0.083)	(0.077)	(0.081)	(0.081)
$sector\_size_{m,c,t-1}$	1.426	1.545	1.328	0.987
	(1.595)	(1.516)	(2.828)	(1.552)
Annual Dummies	yes	yes	yes	yes
Sector-Time Dummies	yes	yes	no	yes
Observations	55,162	55,162	55,162	55,162
Firms	23,882	23,882	23,882	23,882
R-squared	0.035	0.038	0.029	0.036

OLS estimation with firm-fixed effects, robust variance estimates and clustered error terms for sectors within countries. Standard errors in parentheses: *** p≤0.01, ** p≤0.05, * p≤0.1.

The other sectoral control variables in Table 5.2 indicate that foreign presence in the firm's manufacturing sector has a small negative impact on the productivity of domestic manufacturing firms. Thus, the results are in-line with the literature suggesting that FDI spillovers occur on a vertical rather than on a horizontal dimension (see e.g. Havranek and Irsova 2011). This result suggests that foreign owned firms are less exposed to the negative effect of an increase in competition in the own sector than domestic ones. The effect of the sector's relative size is slightly positive for domestic firms and insignificant for foreign controlled ones.

In Table 5.3 firm-specific factors are added to the regression. The baseline specification reported in column 1, confirms the finding that services FDI lead to a productivity increase of domestic manufacturing firms. The coefficient estimate of 1.208 suggests that the increasing share of services provided by foreign controlled firms led *ceteris paribus* to a productivity growth of 0.16% between 2003 and 2008. When omitting sector-time dummies capturing differences in the technological progress across manufacturing sectors, the effect of the foreign services linkage shrinks, but remains significantly positive.

As a robustness check, the share of foreign services over all domestic inputs is replaced by a linkage index referring to the EBRD transition indicators. Under the consideration of the coefficient estimate of 0.758, the increasing average score of the EBRD transition indicators (from 3.17 in 2003 to 3.38 in 2008) and the rising services intensity in manufacturing (from 51.3% in 2003 to 54.8% in 2008) led to a productivity growth of 0.28% in manufacturing. This result confirms that liberalized services sectors foster the productivity of manufacturing firms.

Corresponding to the results presented in Table 5.2, the results in Table 5.3 indicate that the effect of horizontal FDI spillovers in manufacturing is slightly negative on the productivity of domestic firms, while the effect of the manufacturing sector's size turns out to be insignificant across all specifications in Table 5.3.

The firm-specific regressors indicate that the effect of labor costs and firm's age turns out to be negligible, whereas smaller and capital-intensive firms tend to experience large productivity gains. In column 2, the effect of the firms' absorptive capacity is analyzed in depth, by interacting the foreign services linkage with the firms' capital formation and labor compensation. The negative effect of both interaction terms leads to the conclusion that firms with a high absorptive capacity are less dependent from forward spillovers induced by services provided by foreign firms.

In Table 5.4, the sample is split into six subsamples in order to check whether the results are driven by observations of a single country. Each country is excluded in one subsample.[60] For each subsample the coefficient estimate of the foreign services linkage is significantly positive, suggesting that the positive impact of services FDI

[60] Single-country regressions cannot be implemented as long as the regressions include sector-time dummies, which control for a diverging technological progress across sectors. In this case, the foreign services linkage, which is assumed to be equal across the firms of the same manufacturing industry at time t, could not be investigated due to multicollinearity.

Table 5.4: Spillover of services FDI on domestic firms - Countries

dependent Variable	Exclusion of the observations from					
$\ln(VA/L)_{i,m,c,t}$	Bulgaria	Czech Rep.	Estonia	Romania	Slovakia	Slovenia
$SL_{m,c,t-1}$	-0.591***	-0.491**	-0.895***	-0.637***	-0.458***	-0.357**
	(0.171)	(0.185)	(0.187)	(0.189)	(0.132)	(0.160)
$FOR\_SL_{m,c,t-1}$	1.658***	0.759**	1.757***	1.043***	1.192***	0.737*
	(0.453)	(0.359)	(0.516)	(0.368)	(0.328)	(0.368)
$ln(L)_{i,t-1}$	-0.086***	-0.048***	-0.072***	-0.049*	-0.051***	-0.067***
	(0.012)	(0.014)	(0.015)	(0.026)	(0.014)	(0.015)
$ln(K/L)_{i,t-1}$	0.013	0.019*	0.013	0.011	0.015	0.010
	(0.009)	(0.011)	(0.012)	(0.033)	(0.012)	(0.012)
$ln(wage)_{i,t-1}$	0.019	-0.029*	0.014	0.183***	-0.010	0.018
	(0.021)	(0.016)	(0.019)	(0.037)	(0.019)	(0.022)
$ln(age)_{i,t}$	-0.009	-0.013	-0.033	0.014	-0.015	-0.037
	(0.023)	(0.027)	(0.027)	(0.033)	(0.025)	(0.030)
$hor\_FDI_{m,c,t-1}$	-0.119	-0.237**	-0.175	-0.410***	-0.131	-0.241**
	(0.135)	(0.106)	(0.110)	(0.093)	(0.117)	(0.105)
$sector\_size_{m,c,t-1}$	1.233	2.659	2.026	1.175	1.206	0.874
	(1.487)	(1.809)	(1.505)	(1.425)	(1.300)	(1.998)
Observations	50,093	43,854	52,890	25,787	52,062	51,124
Firms	21,155	18,656	22,963	11,925	22,273	22,438
R-squared	0.036	0.032	0.036	0.071	0.034	0.036

OLS estimation with firm-fixed effects, robust variance estimates and clustered error terms for sectors within countries. Standard errors in parentheses: *** p≤0.01, ** p≤0.05, * p≤0.1.

on the productivity of manufacturing observed in Table 5.3 is qualitatively not driven by the observations of a single economy.

In comparison to the coefficient estimate of 1.208 in the baseline regression presented in Table 5.3, the output in Tables 5.4 reports bigger estimates for the subsamples excluding firms located either in Bulgaria or Estonia. In this case, the coefficient estimates of the baseline model were lowered by the observation of the firms missing the subsample. Therefore, the results suggest that the effect of services FDI is lower in Bulgaria and Estonia than in the other countries. Contrary, the opposite holds for coefficients below the baseline estimate, which is the case for the subsamples excluding either Czech, Romanian, Slovakian, or Slovene observations. With respect to the baseline estimate, the potential for forward spillovers from services FDI to manufacturing is bigger in these countries.

The firm-specific estimates differ only marginally across the subsamples. The effect of the firm's size on productivity is significantly negative across all specifications, while the impact of age and capital intensity are insignificant except of the coefficient of the capital intensity excluding firms located in the Czech Republic. The coefficients of labor compensation are insignificant except for the subsamples excluding either Czech (negative) or Romanian (positive) firms. With respect to horizontal FDI spillovers, the results in Table 5.4 suggest that the negative effect of the baseline

model is driven by the countries of Bulgaria, Estonia, and Slovakia, which report negative but insignificant estimates for horizontal FDI.

Table 5.5: Spillover of services FDI on domestic firms - Initial size and initial productivity

dependent Variable	Initial size		Initial productivity		Initial size and intital productivity			
$\ln(VA/L)_{i,m,c,t}$	small	large	high	low	small & high	small & low	large & high	large & low
$SL_{m,c,t-1}$	-0.738***	-0.203	-0.569***	-0.638**	-0.666***	-0.942***	-0.325	-0.311
	(0.139)	(0.252)	(0.192)	(0.264)	(0.164)	(0.176)	(0.282)	(0.439)
$FOR\_SL_{m,c,t-1}$	1.477***	0.728	1.120**	1.542**	1.345***	1.837***	0.409	1.581*
	(0.411)	(0.451)	(0.480)	(0.577)	(0.458)	(0.491)	(0.689)	(0.852)
$ln(L)_{i,t-1}$	-0.055***	-0.099***	-0.061***	-0.072***	-0.049**	-0.076**	-0.110***	-0.059
	(0.014)	(0.026)	(0.019)	(0.025)	(0.019)	(0.027)	(0.032)	(0.056)
$ln(K/L)_{i,t-1}$	0.021	-0.018	0.016	0.000	0.015	0.027	0.004	-0.056
	(0.013)	(0.015)	(0.019)	(0.027)	(0.020)	(0.035)	(0.029)	(0.033)
$ln(wage)_{i,t-1}$	-0.012	0.132**	-0.003	0.069*	-0.032**	0.048	0.136**	0.139**
	(0.014)	(0.047)	(0.020)	(0.036)	(0.015)	(0.036)	(0.055)	(0.061)
$ln(age)_{i,t}$	-0.061**	0.101*	-0.016	-0.032	-0.061*	-0.071	0.113	0.072
	(0.027)	(0.049)	(0.033)	(0.053)	(0.030)	(0.070)	(0.067)	(0.073)
$hor\_FDI_{m,c,t-1}$	-0.209	-0.224*	-0.168	-0.213	-0.171	-0.259	-0.210	-0.176
	(0.123)	(0.118)	(0.129)	(0.140)	(0.117)	(0.218)	(0.268)	(0.218)
$sector\_size_{m,c,t-1}$	0.424	3.289	0.246	3.032*	-1.168	4.062	2.310	4.548
	(2.711)	(2.416)	(1.764)	(1.478)	(3.076)	(3.134)	(2.430)	(3.259)
Observations	40,384	14,778	39,532	15,630	30,317	10,067	9,215	5,563
Firms	17,682	6,200	17,390	6,492	13,478	4,204	3,912	2,288
R-squared	0.033	0.063	0.027	0.076	0.026	0.082	0.065	0.097

OLS estimation with firm-fixed effects, robust variance estimates and clustered error terms for sectors within countries. Annual and sector-time dummies included. Standard errors in parentheses: *** p≤0.01, ** p≤0.05, * p≤0.1. Initial size of firm i measured by employees in 2003 or the first reporting year, respectively. Subsample *small* contains firms with less than 50 employees, *large* 50 or more employees in the initial year. Initial productivity of firm i is determined by the median productivity measured by valued added per employees in manufacturing sector m in country c in 2003 or the first reporting year, respectively. If the initial productivity is above the corresponding median, firm i belongs to the subsample *high* and to the subsample *low* otherwise.

In Table 5.5, the sample is split into several subsamples with respect to the initial size and the initial productivity of the sample's firms. Firstly, the sample is divided into two groups determined by the amount of employees in the first reporting year of firm i, 2003 or later. A firm belongs to the subsample of small enterprises if it reported less than 50 employees in the initial year, while firms with an initial workforce of at least 50 employees belong to the subsample of large enterprises. Secondly, the median productivity for each manufacturing sector m in country c at time t is considered as a benchmark in order to investigate the impact of the firms' initial productivity. If the productivity of a firm is below its sectoral median in the first reporting year, it belongs to the subsample of initially low productive firms and to the subsample of high performing firms otherwise. Thirdly, the sample is split into four groups with respect to both dimensions, initial size and productivity.

With respect to the initial size, the results in columns 1 and 2 of Table 5.5 show that small firms are the beneficiaries of services FDI rather than large ones. For small firms, the estimate suggests that an one-percentage point rise of the share of foreign services used as inputs in manufacturing, leads to an annual productivity increase of 0.0148%. Over the period of investigation, this estimate suggests that the increasing share of foreign services spurred the productivity of initially small manufacturing firms *ceteris paribus* by 0.20%. The effect for large firms turns out to be insignificant.

The result that initially large firms are less affected by the foreign presence in the services sector might stem from the possibility that large firms either source their inputs internally or have access to a larger network of potential suppliers.

With respect to the firms' initial productivity, the effect of services FDI is significantly positive for both types of firms. The same result can be observed for initially small firms. Contrary, the spillover potential of services FDI on the productivity of large manufacturing firms varies with respect to the initial productivity; large and initially low performing firms report a significant positive impact, while the performance of large firms with a high initial productivity does not seem to be affected by the foreign presence in the services sectors.

The output in Table 5.5 shows that the other sector-specific regressors, horizontal FDI and sectoral size, are predominantly insignificant, with an exception of the negative effect of horizontal FDI on the productivity of large firms and a positive sector size effect for initially low productive firms. The firm-specific variables confirm the negative size effect, whereas effect of the firms' capital intensity remains negligible. Furthermore, the productivity of large firms seems to be positively affected by the firms' age and labor compensation, while the performance of small and productive firms seems to be negatively affected by the wage rate and the firm's age.

In Table 5.6, the sample is divided into 13 subsamples driven by the Nace Rev 1.1 classification. A separate regression for the sector of coke, refined petroleum products, and nuclear fuel (Nace Rev 1.1 Code 23) has not been implemented due to the low number of observations. Concerning the share of foreign services used as inputs in each sector, six sectors report a significant positive impact of services FDI on the firms' performance, namely the sectors of food products, beverages and tobacco (Nace Rev 1.1 Codes 15 and 16), leather and leather products (Nace 19), wood and wood products (Nace 20), pulp, paper and paper products; publishing and printing (Nace 21 and 22), chemicals, chemical products and man-made fibres (Nace 24) and rubber and plastic products (Nace 25). The coefficient estimates for the remaining sectors are insignificant.

Table 5.6: Spillover of service FDI on domestic firms across each manufacturing sector - NACE Rev.1.1

dependent Variable	Manufacturing sector. Nace Rev 1.1 2-Digit Codes												
$\ln(VA/L)_{i,m,c,t}$	15-16	17-18	19	20	21-22	24	25	26	27-28	29	30-33	34-35	36-37
$SL_{m,c,t-1}$	-0.755	-0.227	-0.773***	-1.695	-1.729**	-1.577***	-1.376*	-0.988	-1.639**	-1.012**	-0.260	-0.847	-0.426
	(0.514)	(0.217)	(0.187)	(0.848)	(0.460)	(0.299)	(0.587)	(1.094)	(0.630)	(0.278)	(0.225)	(0.838)	(0.902)
$FOR\_SL_{m,c,t-1}$	4.734**	0.238	2.129**	5.213*	3.143***	1.772***	4.443**	-0.811	2.573	-0.025	1.545	0.840	-0.433
	(1.827)	(0.624)	(0.727)	(2.385)	(0.750)	(0.262)	(1.704)	(0.852)	(1.815)	(0.805)	(0.791)	(2.191)	(2.602)
$ln(L)_{i,t-1}$	-0.071**	-0.079***	-0.097*	-0.085**	-0.029	0.021	0.038	0.006	-0.126***	-0.155***	0.004	-0.126	-0.041
	(0.021)	(0.017)	(0.041)	(0.029)	(0.124)	(0.070)	(0.032)	(0.037)	(0.031)	(0.030)	(0.089)	(0.068)	(0.029)
$ln(K/L)_{i,t-1}$	-0.007	0.019	-0.141***	0.033*	-0.023	0.015	0.161	0.030	-0.008	-0.021	-0.039	0.048	0.028
	(0.020)	(0.025)	(0.025)	(0.015)	(0.060)	(0.035)	(0.103)	(0.047)	(0.020)	(0.029)	(0.036)	(0.059)	(0.033)
$ln(wage)_{i,t-1}$	-0.043	-0.014	0.027	0.080	-0.045	0.145	-0.074	0.022	0.054	0.198**	0.087	0.025	0.006
	(0.058)	(0.072)	(0.016)	(0.094)	(0.042)	(0.076)	(0.077)	(0.089)	(0.137)	(0.072)	(0.158)	(0.068)	(0.072)
$ln(age)_{i,t}$	0.058*	-0.092*	-0.030	-0.006	-0.028	-0.314*	-0.087	0.009	0.022	0.042	0.050	0.156**	-0.155**
	(0.027)	(0.044)	(0.052)	(0.102)	(0.087)	(0.127)	(0.059)	(0.033)	(0.031)	(0.119)	(0.056)	(0.058)	(0.060)
$hor\_FDI_{m,c,t-1}$	0.975**	0.159	-0.172	-1.192***	-0.389*	0.132	-0.721	-0.183	-0.334*	-0.100	-0.482***	-0.402	0.430
	(0.306)	(0.230)	(0.345)	(0.237)	(0.181)	(0.167)	(0.421)	(0.304)	(0.131)	(0.515)	(0.113)	(0.454)	(0.468)
$sector\_size_{m,c,t-1}$	30.298***	-2.747	-40.475	-37.261	-18.360	8.585	-61.641**	10.718	10.014*	-3.459	0.487	-3.748	6.909
	(2.889)	(6.285)	(38.840)	(51.055)	(16.031)	(15.473)	(22.535)	(15.901)	(4.192)	(4.568)	(3.198)	(4.860)	(9.673)
Observations	9,833	6,350	1,447	4,544	3,783	1,637	3,168	2,414	8,658	3,780	3,427	1,216	4,862
Firms	4,243	2,764	647	1,919	1,583	667	1,377	1,118	3,883	1,610	1,481	540	2,033
R-squared	0.036	0.018	0.046	0.033	0.025	0.026	0.078	0.091	0.063	0.084	0.053	0.063	0.032

OLS estimation with firm-fixed effects, robust variance estimates and clustered error terms within countries. Annual dummies included. Standard errors in parentheses: *** p≤0.01, ** p≤0.05, * p≤0.1.

By taking the development of the share of foreign services used as inputs across each manufacturing sector into account, the results indicate that the leather sector experienced the largest productivity boost of nearly 0.7% between 2003 and 2008, which was induced by the increasing share of services FDI. According to the coefficient estimates, the rise of foreign presence in services led to a productivity increase of 0.56% in the wood processing sector and to a 0.47% rise in the rubber and plastic sector. The effect in the sector of food processing (0.39%) as well as in the paper (0.28%) and chemical industry (0.24%) were slightly lower.

Table 5.7: Services FDI spillover on domestic manufacturing firms - Pavitt's classification

dependent Variable $\ln(VA/L)_{i,m,c,t}$	Scale intensive	Science based	Specialized suppliers	Suppliers dominated
$SL_{m,c,t-1}$	-0.632**	-0.282	-0.579	-0.580***
	(0.232)	(0.354)	(0.352)	(0.197)
$FOR\_SL_{m,c,t-1}$	0.899	1.030**	1.539	1.269**
	(0.669)	(0.417)	(0.935)	(0.560)
$ln(L)_{i,t-1}$	-0.085*	0.031	-0.038	-0.075***
	(0.048)	(0.070)	(0.046)	(0.015)
$ln(K/L)_{i,t-1}$	-0.008	-0.017	0.091**	0.007
	(0.020)	(0.039)	(0.040)	(0.011)
$ln(wage)_{i,t-1}$	0.045	0.054	-0.014	0.015
	(0.060)	(0.118)	(0.046)	(0.039)
$ln(age)_{i,t}$	0.030	-0.147	0.033	-0.035
	(0.067)	(0.098)	(0.067)	(0.033)
$hor\_FDI_{m,c,t-1}$	-0.320	0.059	-0.370*	-0.177
	(0.189)	(0.135)	(0.188)	(0.124)
$sector\_size_{m,c,t-1}$	0.548	2.648	5.185	0.363
	(2.283)	(3.855)	(6.396)	(2.931)
Observations	9,304	3,366	7,574	34,918
Firms	3,957	1,401	3,371	15,153
R-squared	0.039	0.030	0.068	0.031

OLS estimation with firm-fixed effects, robust variance estimates and clustered error terms for sectors within countries. Annual and sector-time dummies included. Standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1.

According to Pavitt (1984), the manufacturing industry can be split into four different groups with respect to the technological capability. The output for each Pavitt class is reported in Table 5.7. In Table 5.6, the sectors with significant positive effects of services FDI belong the following groups: suppliers dominated (food and leather sector), scale intensive (paper sector), and science based firms (chemical industry) as well as specialized suppliers (rubber and plastic sector).

Concerning the foreign services linkage, the companies belonging to the groups of science based and suppliers dominated firms were boosted most from the foreign presence in services. The estimates suggest that the raising share of services FDI spurred the productivity of supplier dominated firms by almost 0.2% and the pro-

ductivity of science based firms by 0.15%. The effect on the groups of scale intensive firms and science based enterprises is insignificant.

The coefficient estimates for the other sector-specific regressors, horizontal FDI and sector's size, are insignificant with an exception of a slightly negative impact of horizontal FDI in the subsample of specialized suppliers. The firm-specific explanatory variables suggest that the firms' size has a negative impact on the productivity of supplier dominated and scale intensive firms. With respect to the capital intensity, only the group of specialized suppliers reports a positive effect on the performance of firms. The effect of the firms' age and labor compensation is insignificant across all subsamples in Table 5.7.

The last part of the analysis is presented in Table 5.8 and focuses on the disaggregation of the services sector in order to detect the sectors driving the productivity growth of manufacturing firms. For this purpose, services linkage measures are calculated for five services sectors separately: energy supply (Nace 40 and 41), wholesales and retail trade (Nace 50 to 52), transportation and telecommunication (Nace 60 to 64), financial services (Nace 65 to 67) and business services (Nace 70 to 74). The results presented in Table 5.8 show that for domestic firms, foreign presence in the energy sector drives the positive effect of the aggregate services linkage reported in the baseline regression reported in Table 5.3.

With respect to the firm's initial size, the aggregate positive effect of services FDI on the productivity of small manufacturing firms is driven by FDI in the sectors of energy supply and financial services. For initially large firms, the positive impact of FDI in business services is offset by the negative effect of FDI in wholesales and retail trade. With respect to the firms' initial productivity, the disaggregate services linkage measure does not identify a specific services sector explaining the positive aggregate effect of services FDI for firms with a higher initial productivity. For initially low productive firms, the results suggest that the positive impact of services FDI rests upon the sectors of energy supply and business activities.

Table 5.8: Service FDI spillover on domestic manufacturing firms with disaggregated service linkage.

dependent Variable $\ln(VA/L)_{i,m,c,t}$	domestic firms	small	large	high	low	Scale intensive	Science based	Specialized suppliers	Suppliers dominated
$FOR\_SL\_ENERGY_{m,c,t-1}$	2.430***	2.887**	1.743	1.572	4.385***	4.367	2.342**	0.514	4.803**
	(0.803)	(1.145)	(1.056)	(1.103)	(1.044)	(3.778)	(1.088)	(1.390)	(1.818)
$FOR\_SL\_WR_{m,c,t-1}$	-1.487	-1.150	-3.152**	-0.934	-2.639	-7.529***	-8.552***	-5.771**	-0.561
	(1.078)	(1.120)	(1.567)	(1.290)	(1.593)	(2.679)	(2.316)	(2.301)	(1.124)
$FOR\_SL\_INFRA_{m,c,t-1}$	0.367	0.139	1.425	1.632	-2.347	-1.904	-8.216**	3.897**	-0.386
	(1.321)	(1.566)	(1.941)	(1.547)	(2.261)	(2.093)	(3.602)	(1.782)	(2.124)
$FOR\_SL\_FIN_{m,c,t-1}$	3.096	4.825*	1.431	2.791	4.037	-0.009	7.582	2.750	1.524
	(2.273)	(2.465)	(2.922)	(2.650)	(3.045)	(5.754)	(5.735)	(6.946)	(2.763)
$FOR\_SL\_BS_{m,c,t-1}$	1.836	1.120	2.973*	0.796	3.753**	3.890	9.436***	2.539	1.046
	(1.222)	(1.271)	(1.559)	(1.515)	(1.528)	(2.285)	(2.906)	(3.641)	(1.997)
Observations	55,162	40,384	14,778	39,532	15,630	9,304	3,366	7,574	34,918
Firms	23,882	17,682	6,200	17,390	6,492	3,957	1,401	3,371	15,153
R-squared	0.036	0.034	0.065	0.028	0.078	0.043	0.038	0.075	0.032

OLS estimation with firm-fixed effects and robust variance estimates. Annual and sector-time dummies included. Standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1. The following variables are included, but not reported: Serivce linkage is included for each service sector, horizontal FDI, size of manufacturing sector, as well capital intensity, employees, wages and age of firm i. The coefficients of these variables are available up on request. The abbreviations represent the following service sectors: ENERGY=Energy Supply (NACE 40-41); WR=Wholesales and Retail trade (NACE 50-52); INFRA=Transportation and telecommunication (NACE 60-64); FINANCE=Financial Services (NACE 65-67), and BUSINESS=Business services (NACE 70-74). Intial size of firm i measured by employees in 2003 or the first reporting year, respectively. Subsample *small* contains firms with less than 50 employees, *large* 50 or more employees in the initial year. Initial productivity of firm i is determined by the median productivity measured by valued added per employees in manufacturing sector m in country c in 2003 or the first reporting year, respectively. If the initial productivity is above the corresponding median, firm i belongs to the subsample *high* and to the subsample *low* otherwise.

The division of manufacturing firms with respect to Pavitt's classification, shows that each class is characterized by a different pattern of services FDI spillovers. For the suppliers dominated sectors, which are located at the end of the production chain, the estimates show that the aggregate positive effect of services FDI through forward linkages is driven by the foreign presence in the energy sector. The positive impact of services FDI on science based firms is driven by FDI in the sectors of energy supply and business services, which seem to dominate the negative effect of foreign presence in the sectors of wholesales and infrastructure. For the remaining two groups of firms the aggregate effect of services FDI is insignificant. For the group of specialized suppliers, the positive impact of telecommunication and transportation services provided by foreign controlled firms seems to be offset by the negative impact of FDI in the sector of wholesales and retail trade. The aggregate effect of services FDI for the group of scale intensive firms is insignificant despite the negative effect of foreign presence in the sector of wholesales and retail trade.

5.6 Conclusion

This chapter investigates whether and how services FDI affect the productivity of manufacturing firms in six new member states (Bulgaria, Czech Republic, Estonia, Romania, Slovakia and Slovenia) of the European Union between 2003 and 2008. Economically and politically, this question is of interest since the analysis focuses on the period when these countries' joined the EU, which was accompanied by far-reaching liberalization reforms. In the context of the market reforms, the NMS experienced a large growth in the share of foreign investments across sectors and countries. The analysis confirms previous findings on the positive impact of services FDI on the productivity of domestic manufacturing firms through vertical forward spillovers (see e.g. Arnold, Javorcik, and Mattoo 2011). Thus, services FDI contribute to the competitiveness of manufacturing in Central East European new EU member states.

Despite the fact that FDI in the services sector account for more than two thirds of the total FDI stock in the NMS and that services are used as an increasing input in manufacturing, there is little evidence in the literature on the effect of foreign presence in the services sector on the productivity of manufacturing firms. The empirical investigation of this issue is based on a combination of firm-level information with sectoral statistics and annual national input-output tables. In the

analysis, several dimensions of firm heterogeneity (e.g. the sector classification, size, ownership, and the initial productivity) are taken into consideration. Furthermore, the disaggregation of the effect of services FDI into five dimensions allows the detection of the sectoral origin of the source sectors of services FDI spillovers. Therefore, this chapter contributes to the literature through its multi-country setting, the use of annual input-output tables as well as the identification of the services sectors driving the forward spillovers from services FDI to manufacturing.

The results show that domestic manufacturing firms are the beneficiaries of foreign presence in the services sectors. Over the period of investigation, the estimates show that the productivity of all firms reporting at least 10 employees experienced a productivity growth of 0.14% induced by the increasing share of foreign services used as inputs. The division of the sample into domestic and foreign controlled firms shows that domestic firms benefit from foreign presence in the services sector rather than foreign ones, with an aggregate effect of 0.16% vs. 0.06% over the five years of investigation. The high technological cappability as well as the possibility of foreign controlled firms to make use of additional opportunities to source their required services might serve as an explanation for the difference between domestic and foreign owned firms.

For domestic firms, the findings turn out to be robust and are not driven by a single country as shown in Table 5.4. The findings suggest that the effect of services FDI on the productivity growth is lower for firms with a high degree of absorptive capacity. With respect to the initial size and productivity of the sample's firms, the results show that services FDI spur the productivity of small firms rather than large ones. Furthermore, the effect of services FDI does not differ for subsamples, which are split according to their initial productivity. The combination of the initial size and productivity leads to the finding that only large firms with an initially higher productivity do not benefit from forward spillovers from services FDI. Analogue to foreign controlled firms, these firms tend to have a access to wider set of potential suppliers (also abroad) and their high degree of productivity indicates that the demand for services is highly specialized and, thus, less dependent on the local supply of services.

The sectoral distinction into thirteen manufacturing sectors with respect to the NACE Rev 1.1 classification detects sectors, which significantly benefit from services FDI; namely the sectors of food, beverages & tobacco products, leather products, wood products, publishing, printing & paper products, chemical products, as well as

rubber & plastic products. According to Pavitt's classification, the results suggest that firms belonging either to the group of supplier dominated or science based firms experienced a productivity growth of 0.2% or 0.15%, respectively, induced through services FDI. The effect for the groups of specialized suppliers and scale intensive firms was insignificant.

Finally, the aggregate foreign service linkage is split into five measures capturing the share of foreign provided inputs stemming from five different service sectors (energy supply; wholesales and retail trade; transportation and telecommunication; financial services and business services). The aggregate effect for domestic firms seems to be based on the foreign presence in the energy sector, which might have led to low energy costs and a more reliable energy supply. The same holds true for large firms with an initially lower productivity. With respect to Pavitt's classification, firms at the end of the value chain (suppliers dominated firms) were fostered by foreign presence in energy supply, while the positive impact of services FDI on science based manufacturing firms is driven by FDI in the sectors of energy supply and business services.

Anyhow, there are several aspect, which should be kept in mind, when interpreting the resutls of this chapter. Firstly, the analysis is based on strict assumptions concerning the measurement of services FDI spillovers as highlighted by Barrios, Görg, and Strobl (2011). Secondly, although most of firm-level studies on FDI spillovers use sophisticated total factor productivity (TFP) estimation procedures in order to measure productivity, this chapter refers to value added per employee as the dependent variable. This choice is motivated by the quality of sector-country TFP estimations, which partly collapsed in the maximization process, predominantly due to a low amount of observations. Thirdly, regional aspects such as distance between local and foreign firms (see e.g. Merlevede, Schoors, and Spatareanu 2014) were not captured in the regression, since the share of foreign services in sectoral output was taken from aggregate national statistics. This drawback could be solved by using firm-level information including information on the location of foreign firms for the calculation of the foreign services linkage. This approach was not implemented, due to the heterogeneous quality of aggregated sectoral information across countries computed on the basis of the Amadeus database. The latter fact in turn raises questions on the representativeness of the sample and, thus, on the validity of the results. Although the sample contains a bias for firms located in Romania, the results show that the key finding of the positive effect of forward vertical spillovers from

services FDI to manufacturing in Central East European economies is robust and not driven by a single country.

As outlined above, production function approaches on spillovers capture the linkages between sectors via input-output tables assuming a homogenous input structure of firms within a given sector. This firm heterogeneity assumption is relaxed in the field of *International Business*. Therefore, the following chapter applies such an approach capturing the technological heterogeneity of firms through survey data from the *IWH FDI Micro Database*. This procedure allows to collect detailed information on the extent of knowledge transfer and on the intensity of linkages between foreign affiliates and local firms.